1838. Establishment of the meteorological and magnetic observatory at Toronto, Canada.

1838–1842. U. S. Exploring Expedition to the Pacific Ocean under Commander Charles Wilkes, U. S. Navy. Its meteorological work is yet only partially published.

1838–1860. Lieut. M. F. Maury (*b.* 1806, *d.* 1873), Superintendent of the U. S. Naval Observatory, collected ships' logs; compiled and published sailing charts; wrote his work, "The Physical Geography of the Sea."

1838. James H. Coffin, while principal of the Academy at Ogdensburg, N. Y., began the publication of his monthly, "The Meteorological Reporter" which included the records for 1836–1838 made by his self-recording wind integrator which gave the number of hours that each direction of the wind prevailed during those years on the top of the mountain, Greylock, near Williamstown, Mass.

1840. August and September, Espy appeared before the British Association for the Advancement of Science at Glasgow, and the Academy of Sciences at Paris, to expound and defend his ideas as to the theory and cause of storms. A committee of the Paris Academy of Sciences reported favorably on Espy's theory of storms.

1840. Establishment by A. D. Bache (*b.* 1806, *d.* 1867), of the Meteorological and Magnetic Observatory of Girard College, Philadelphia Pa., where hourly observations of temperature and dew-point were made up to 1845.

1840–1850. Discussions between Bache, Henry, Hare, Johnson, Olmstead, and others, both in scientific magazines and newspapers, as to the character of our tornadic and other storms, and the nature of the forces involved therein.

1841. James P. Espy published his work on the "Law of Storms" maintaining the importance of the expansion of the rising air in the formation of thunderstorms, and explaining the special cloud formation known as "The Helm and Bar" in England, and the foehn-phenomena or the warmth of descending air. He also explained the diurnal variation in the wind force and direction; the dryness of descending air near cumulus clouds; the reason why an ascending current produced by a local conflagration might be expected to bring cloud and rain; the reason why some clouds are seen to be melting away and disappearing while others are growing larger and heavier.

1841. Loomis (*b.* 1811, *d.* 1889), published his map and study of the storm of December, 1836, in the Transactions of the American Philosophical Society at Philadelphia, Pa.

1842. Espy appointed "Meteorologist to the U. S. Government" by Congress and assigned to duty under the Surgeon General of the Army, and was so employed from August 26, 1842, to June 30, 1847.

1843. Prof. Dr. Robert Hare (*b.* 1781, *d.* 1858), opposes Espy and others and defends the idea that electricity is the important force in our storms.

1843. Charles Tracy published his memoir on the rotary movement of a storm. He concluded that this movement necessitates searching for a stable source of momentum and showed that the rotation of a storm is the effect of the earth's diurnal rotation, but did not arrive at the full measure of this influence.

1843. October, date of Espy's first meteorological report addressed to the Surgeon General of the Army.

1844. November, completion of the first line of Morse telegraph, between Washington and Baltimore. It was thrown open to the public April 1, 1845, and from this date onward, according to the testimony of old telegraphers, it was customary among the operators to advise each other of local weather by watching and predicting the movement of weather changes.

1847. Establishment by James Green of his workshop for the manufacture of the highest grade thermometers and barometers for the use of the Smithsonian Institution, the Surgeon General, the Army Engineers, and all other meteorological observers.

1847. December 8, Joseph Henry submitted his program of Organization and Work for the Smithsonian Institution, including first of all "A system of extended meteorological observations for solving the problem of American storms." The Smithsonian Institution continued after this date a prominent factor in the development of meteorology in the United States.

1847. Espy and Loomis addressed letters to Prof. Joseph Henry, as Secretary of the Smithsonian Institution, urging the importance of the establishment of meteorological stations and reports for the study of American storms.

1848. August 10, Espy appointed to meteorological work under the Secretary of the Navy and ordered to work in cooperation with the Secretary of the Smithsonian Institution where he prepared the first circulars of the Smithsonian Institution relative to securing meteorological observers.

1848. James Glaisher started daily weather reports for publication in the London Telegraph, and corresponded with the Smithsonian Institution as to similar work in America.

1848. J. Jones, of New York, N. Y., announced his intention of preparing weather maps and forecasts in New York City if properly supported financially, but the enterprise seems to have gone no further.

1849. November, date of Espy's second Meteorological Report (addressed to the Secretary of the Navy).

1850. Professor Guyot compiled the first edition of the Smithsonian Instructions for Meteorological Observers. (Published in 1852.)

1850. October, date of Espy's third Meteorological Report, (addressed to the Secretary of the Navy) with notes dated October, 1851.

[*To be continued.*]

WEATHER BUREAU KIOSKS.

By D. T. MARING, Instrument Division. Dated February 13, 1909.

In nearly all the large cities of the country at which regular, telegraphic-reporting stations of the Weather Bureau are established, the records from automatic instruments and the meteorological data recorded, as well as the daily observations and forecasts that are made, are always open for the benefit of the public, but, unfortunately, the modern development and construction of large and lofty buildings have necessitated the placing therein of the local offices and the exposure of the instruments on their high and comparatively inaccessible roofs. While such offices and instrumental records are, of course, still readily accessible to the public by means of rapidly-moving elevators, and information is easily procurable by universal telephone, yet, the great height of the instruments above the ground, which must be thus exposed for general forecast and climatological purposes, does not give the surface conditions in which the great mass of people move. For these reasons, therefore, there has been a growing demand for more accurate and reliable meteorological records nearer the ground, especially for temperatures, which the public has generally had to obtain as best it could from cheap and inferior thermometers improperly exposed in front of stores and shops.

With a view to meeting this demand in a practicable manner the Chief of the Weather Bureau directed that a suitable structure be designed for installation on street sidewalks, or within public parks, and, under the personal supervision of Prof. Chas. F. Marvin, in charge of the Instrument Division, the shelter shown in the accompanying illustration has been developed.

The name "Kiosk" was selected for this structure as being short and expressive, it being that employed in foreign countries for street shelters and bulletin boards used for a similar purpose. The designs of the foreign kiosks were, however, not found to be suitable to the demands in this country, and several local architects and artists were, therefore, requested to submit competitive plans and sketches. From among these one was selected as best adapted to the special needs of the Weather Bureau. This was perfected along the lines of a four-sided structure about 4 feet square and 7 feet high; with a recessed space on each face 30 inches wide, 35 inches high and 5 inches deep, for the display of instruments, charts, maps, etc., of general meteorological interest; each space being covered by a plate-glass window sash counterbalanced by weights in the corners so as to be easily raised and lowered within the framework itself. The interior was made especially open and free, so that the bulbs and actuating parts of the instruments could be projected therein, where they would be protected from injury, be as completely screened as possible from radiation effects, and yet at the same time, given perfect ventilation to the air. By conventional architectural designs the exterior surfaces were given a pleasing artistic appearance, so that the kiosk as a whole should harmonize with public buildings or other structures near which it might be installed.

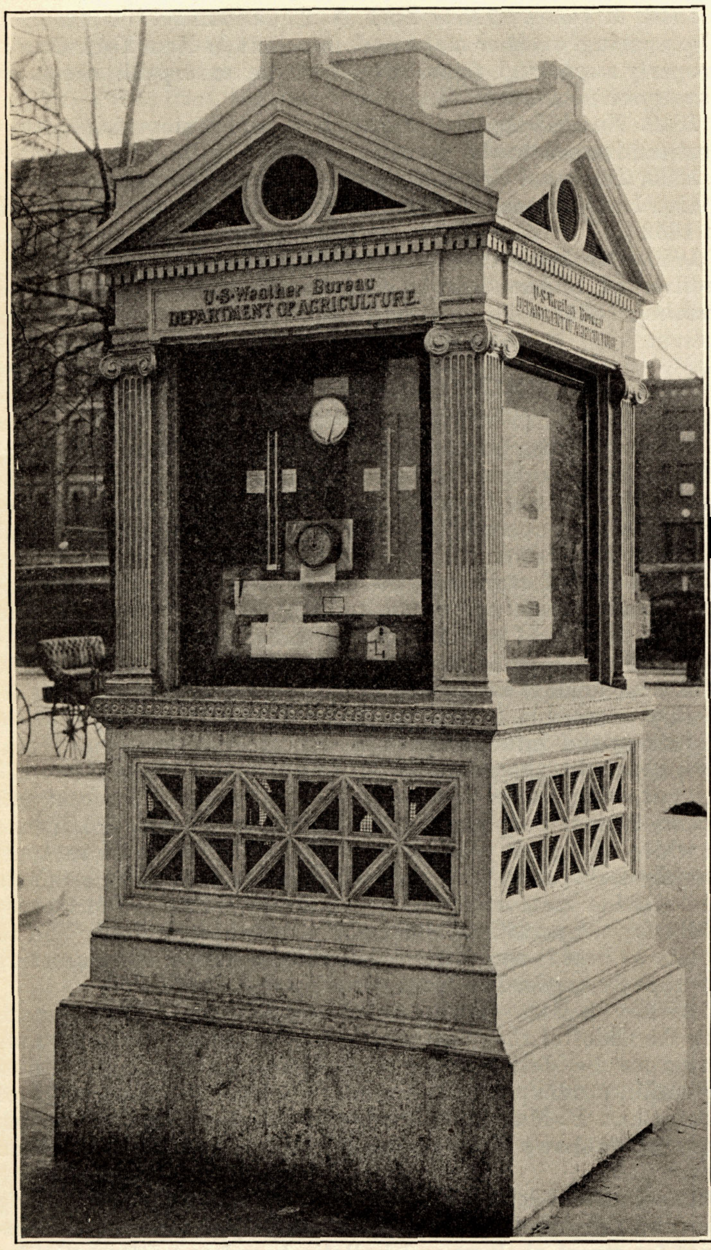

FIG. 1.—General view of kiosk as installed at Washington, D. C. North side, showing instruments in position.

When the plans had advanced sufficiently, they were placed in the hands of a manufacturer familiar with the construction of ornamental iron structures, and arrangements made to have the kiosk built of thin, cast-iron plates, as being the cheapest and most durable material available. The work has been carried out in a very satisfactory manner. When the kiosk is erected on a solid stone or concrete foundation, to which it is securely attached, similar to that shown in the illustration, and kept nicely painted in some light neutral tint to harmonize with surroundings, certain parts being gilded for decorative effects, it forms, as a whole, a neat and substantial structure that should last indefinitely.

Three sides of the kiosk are provided in the recesses with neatly framed wooden bulletin boards, having spring clips that may be arranged in any suitable manner to properly hold, for display, climatic charts, bulletins, daily weather maps, forecasts, etc., or data of special local interest.

Instruments.—The selection and arrangement of the instruments required most careful consideration. As there was nothing on the market entirely suitable for such display as this, it was necessary to perfect the details of each instrument to meet the special needs, and several of the most prominent manufacturers of meteorological apparatus in this country were called upon to carry to perfection the plans and specifications given them in their certain lines. The instrumental equipment, as now provided for, consists of the following:

(1) *Hygrometer.*—A simple form of indicating hair hygrometer, with scale of percentages for relative humidity.

(2) *Thermometer.*—A plain mercurial thermemeter, of large size (Fahrenheit); accurately stem graduated, with conspicuous figures and markings to facilitate easy reading.

(3) *Maximum and minimum thermometers.*—Indicating, self-registering; Fahrenheit scale, stem graduated; of the vertical, Six type; having steel indexes to be set by permanent magnet.

(4) *Raingage.*—This is of the tipping-bucket pattern, with dial mechanism indicating hundreths of an inch and inches of precipitaion as caught in the central top of the kiosk, which forms the receiver of the gage proper, is made of copper, and is 15 inches square.

(5) *Thermograph.*—A form of mechanically recording thermometer, making a continuous and automatic record of the temperature (Fahrenheit), on a two-week sheet of band form, so arranged that the previous record for several days from date is in plain view.

Fig. 2 shows diagrammatically the manner in which these instruments are mounted within the kiosk to secure the best effects and exposures, and, at the same time permit of the most critical inspection of the records and indications made.

As shown in the illustration, fig. 1, the thermograph record sheets may also be displayed just above the instrument, under spring clips at the ends, so that the temperatures for the preceeding two weeks are also available for consultation. Records for the corresponding period of the previous year would form an interesting addition to this part of the exhibit.

Other forms of instruments may be furnished in the future, in addition to those mentioned above, if there is a demand for them, but it is obviously impracticable to attach such registering instruments as those for recording wind direction or velocity, for example, owing to the restricted exposures in which the kiosks must ordinarily be placed.

Suitable printed labels, giving in a concise manner, brief explanations and descriptions, in the simplest possible language, are attached to each instrument, etc., so that its operation and the results secured may be understood by anyone.

While the records obtainable from this apparatus, as a whole, exposed at the ground on city streets within a location more or less entirely inclosed by high office buildings, can not, of course, have special meteorological value, and can not well be used for climatological purposes, they may still, at times, serve as a check on the records of the standard instruments of the Service properly exposed. The kiosk records should also prove useful to the local press, and, as giving actual *street* weather conditions, they should be of considerable utility and of more than passing interest and convenience to the general public.

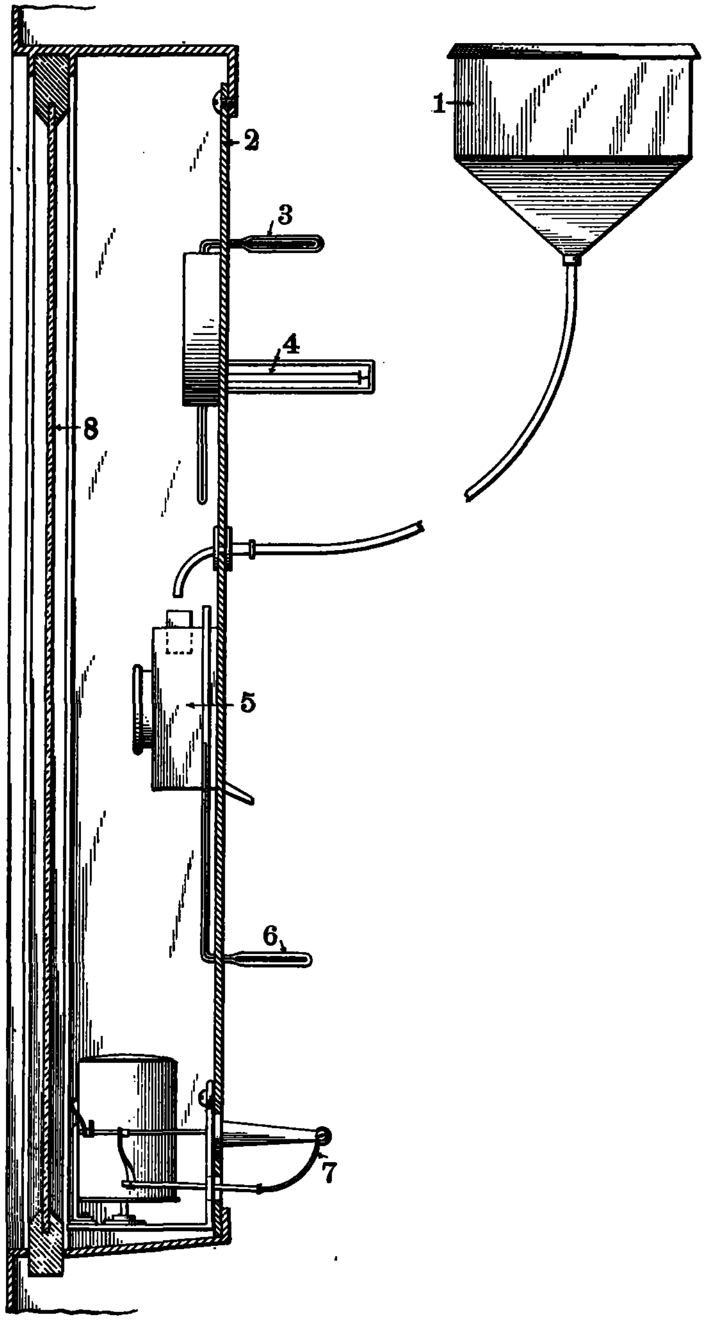

FIG. 2.—Arrangement of instruments in kiosk. Side view. 1. Rain-gage receiver. 2. Iron back plate. 3. Bulb of the Six maximum-minimum thermometer. 4. Frame and hairs of hygrometer. 5. Tipping-bucket dial indicator. 6. Bulb of exposed thermometer. 7. Thermograph bulb. 8. Plate glass in sash.

SUGGESTED REFORMS IN METEOROLOGICAL METHODS.[1]

By M. E. J. GHEURY, F. R. A. S. Dated Eltham, Eng., March 4, 1909.

I understand that discussion is invited concerning Professor McAdie's suggested reforms in meteorological methods. Being a strong supporter of the metric system I would heartily support any reform that would bring this system into use: but, however, in this case, a very careful consideration of meteorological requirements, apart from others, should be undertaken before introducing any special modifications in the present methods of obtaining data as to the various climatologic factors. With this in view I beg to point out a few facts.

Thermometer scales.

While the centigrade scale of temperature is more rational than the Fahrenheit scale, the latter has the advantage that the magnitude of the degree of temperature is small enough to avoid subdivisions for ordinary meteorological purposes, where a greater exactitude suggested by the use of a decimal division of the degree is, to a certain extent, illusory. Decimals can therefore be dropped; and this, together with the fact that the negative sign is only needed in exceptional circumstances or regions, tends to give tabulated temperature data a simplicity which is lacking in similar tables involving the use of the centigrade scale, the magnitude of the degree on the latter being too great not to require subdivisions of some kind (and the most convenient is certainly the decimal).

When such a competent authority as M. G. Eiffel states as desirable the alteration of the centigrade scale so as to have 100° at melting ice and 200° at boiling point, with binary subdivisions, giving therefore almost exactly the degree Fahrenheit as unit and a similar graduation, it would be rash to throw overboard a scale of temperature which has the very advantages found lacking in the rival scale, besides that of being familiar to many. The beautifully simple rule given in the MONTHLY WEATHER REVIEW for 1907, p. 438, which does away with the doubt whether one must or must not add or subtract 32, enables reductions to be performed with such a rapidity and ease as to make the labor of conversion negligible.

Barometer scales.

As to Professor McAdie's proposal to take 760 millimeters as 1,000, the *normal* atmospheric pressure, and to express the height of the barometer as a percentage of this normal pressure, the obvious objection is that this normal pressure is only approximate, and may be altered when a more extensive study of the pressure over the whole globe shall be made. As a matter of fact each place has its own mean barometric pressure, and to adopt as standard a general normal pressure may be very misleading. Professor McAdie has evidently overlooked the existence of regions of *permanent* high and low pressures on the globe, for which such a notation would be very objectionable since it is based on an average barometric height which may be, for such a region, quite abnormal instead of normal.

I remember that in 1897, being south of Cape Horn, with an exceedingly low glass, we remained hove to for three days, waiting for a gale that never came. Had the pressure been expressed by 976, say, or 24 below normal, our captain would have had an excellent excuse for what was otherwise misplaced caution, as the weather was beautiful and my isobaric chart for the season showed that the low pressure was but slightly below the normal.

Moreover, we not only can not say for certain that the average barometric pressure taken all over the globe is 760 millimeters, but we can not say that it is constant and that it has been always at that point or will remain always so. We would have, by taking 760 millimeters, this very great evil of a fluctuating datum mark in our scale of barometric pressure.

The general public, in my opinion, if it does not realize the exact physical meaning of the barometric height, knows pretty well the general inference to draw from a rise or fall. I have had often to answer the inquiries of cultivators (who could have hardly made a correct inquiry by writing!) as to the behavior of my barometer during hay-making time. This, I consider, is a far more important notion, since we know that an

[1] See Monthly Weather Review, November, 1908, 36:372–374.